

What is claimed is:

1. A surveying instrument comprising:
  - a sighting telescope optical system through which a sighting object can be sighted;
  - 5 a distance measuring system which measures a distance to said sighting object, and outputs first data;
  - a phase detection autofocus system which detects a focus state of an image of said sighting object on a reference focal plane, and outputs second data; and
  - 10 an AF driver which moves a focusing lens of said sighting telescope optical system to bring said sighting object into focus in accordance with one of said first data and said second data.

2. The surveying instrument according to claim 1,
    - 15 further comprising a start button,
      - wherein said distance measuring system and said AF driver operate consecutively upon a single-push operation of said start button.

3. The surveying instrument according to claim 1,
      - 20 further comprising a controller which provides a consecutive autofocus mode in which said sighting object is brought into focus automatically consecutively via said AF driver, and a consecutive distance measurement mode in which said distance to said sighting object is
      - 25 consecutively measured via said distance measuring system;

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wherein said consecutive autofocus mode starts at the same time said consecutive distance measurement mode is started.

4. The surveying instrument according to claim 1,  
5 further comprising a controller which drives said AF driver to move said focusing lens to a predetermined position thereof so that an object at a predetermined distance is in focus when said sighting object is unable to be brought into focus in the case of a measurement mode in which a  
10 target is set at an arbitrary point.

5. The surveying instrument according to claim 1,  
wherein said surveying instrument is a total station.

6. The surveying instrument according to claim 1,  
wherein said distance measuring system comprises a  
15 distance meter having a light-emitting element and a light-receiving element.

7. The surveying instrument according to claim 1,  
wherein said phase detection autofocus system comprises a pair of line sensors.

20 8. A surveying instrument comprising:  
a sighting telescope optical system through which a sighting object can be sighted;  
a distance measuring system which measures a distance to said sighting object; and  
25 a phase detection autofocus system which detects a

focus state of an image of said sighting object on a reference focal plane; and

an AF driver which moves a focusing lens of said sighting telescope optical system to bring said sighting object into focus in accordance with an output of said phase detection autofocus system.

9. The surveying instrument according to claim 8, wherein said AF driver moves said focusing lens to bring said sighting object into focus in accordance with an output of said phase detection autofocus system without the use of a reflective device at a point of said sighting object.

10. The surveying instrument according to claim 8, further comprising a start button,  
15 wherein said distance measuring system and said AF driver operate consecutively upon a single-push operation of said start button.

11. The surveying instrument according to claim 8, further comprising a controller which provides a consecutive autofocus mode in which said sighting object is brought into focus automatically consecutively via said AF driver, and a consecutive distance measurement mode in which said distance to said sighting object is consecutively measured via said distance measuring system;  
25 wherein said consecutive autofocus mode starts at the

same time said consecutive distance measurement mode is started.

12. The surveying instrument according to claim 8, further comprising a controller which drives said AF driver 5 to move said focusing lens to a predetermined position thereof so that an object at a predetermined distance is in focus when said sighting object is unable to be brought into focus in the case of a measurement mode in which a target is set at an arbitrary point.

10 13. The surveying instrument according to claim 8, wherein said surveying instrument is a total station.

14. The surveying instrument according to claim 8, wherein said distance measuring system comprises a distance meter having a light-emitting element and a 15 light-receiving element.

15. The surveying instrument according to claim 8, wherein said phase detection autofocus system comprises a pair of line sensors.

16. A surveying instrument comprising:  
20 a sighting telescope through which a sighting object can be sighted; and

an AF drive unit which is provided separately from said sighting telescope, wherein said AF drive unit can be mounted to and dismounted from a body of said surveying 25 instrument;

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said AF drive unit including:

a sensor which receives part of a light bundle which is passed through an objective lens of said sighting telescope;

5 a drive mechanism which drives a focusing lens group of said sighting telescope along an optical axis thereof;

a controller which inputs sensor data output from said sensor to control the operation of said drive mechanism in accordance with said input sensor data so as 10 to focus said sighting telescope on said sighting object; and

a driving force transmitting device which transmits a driving force generated by said drive mechanism to said focusing lens group in a state where said AF drive unit 15 is mounted to said body of said surveying instrument.

17. The surveying instrument according to claim 16, further comprising a light guide, provided between said AF drive unit and said body of said surveying instrument, for guiding said part of said light bundle which is passed 20 through said objective lens to said sensor.

18. The surveying instrument according to claim 17, wherein said light guide comprises a first aperture formed on said body of said surveying instrument and a second aperture formed on a body of said AF drive unit, said first 25 aperture and said second aperture being aligned so that

said part of said light bundle can travel from inside of said body of said surveying instrument to said sensor via said first and second apertures.

19. The surveying instrument according to claim 16,  
5 wherein said AF drive unit comprises a focus control portion which is manually operated to control said operation of said drive mechanism.

20. The surveying instrument according to claim 19,  
wherein said focus control portion comprises an AF start  
10 button, said controller performing an autofocus operation upon said AF start button being depressed.

21. The surveying instrument according to claim 19,  
wherein said focus control portion is positioned in the vicinity of an eyepiece of said sighting telescope.

15 22. The surveying instrument according to claim 16,  
wherein at least one of said drive mechanism and said AF controller is supplied with power from a battery accommodated in said AF drive unit.

23. The surveying instrument according to claim 16,  
20 wherein said body of said surveying instrument comprises a manual focus system with which said focusing lens group can be manually moved to adjust a focal point of said sighting telescope.

24. The surveying instrument according to claim 16,  
25 wherein said body of said surveying instrument comprises

a motorized manual focus system with which said focusing lens group can be manually moved by operating at least one hand-operated member to adjust a focal point of said sighting telescope.

5        25. The surveying instrument according to claim 16, wherein said body of said surveying instrument comprises said sighting telescope.

26. The surveying instrument according to claim 16, wherein said surveying instrument is a total station.

10       27. The surveying instrument according to claim 16, wherein said driving force transmitting device comprises:

            a first gear provided in said AF drive unit, said first gear partly projecting out of said AF drive unit;  
            and

15       a second gear provided in said body of said sighting telescope;

            wherein said first gear and said second gear mesh with each other in a state where said AF drive unit is mounted to said body of said surveying instrument.

20       28. The surveying instrument according to claim 27, wherein said second gear partly projects out of said body of said surveying instrument.

25       29. The surveying instrument according to claim 17, wherein said body of said surveying instrument comprises said sighting telescope;

wherein said sighting telescope comprises an erecting optical system positioned behind said focusing lens group; and

wherein said light guide comprises a beam splitting 5 optical member attached to a surface of said beam splitting optical member.

30. The surveying instrument according to claim 29, wherein said erecting optical system comprises a Porro-prism.